

#1
SAPC / 4120
COPY 1 OF 4

Configuration C

Ground Support Equipment

Proposed 20 March 1957

Part I	Introduction
Part II	Technical Description
Part III	Proposed Contract Exhibit

20 March 1957

AERIAL SURVEYING EQUIPMENT PROJECT PLAN

Part I: Introduction

At the initiation of the Project, it was recognized that special Ground Support Equipment would be required for Configuration C. At that time, it was not possible to delineate the scope of the equipment or its particular features. Now, however, the design, manufacture, and test of Configuration C has progressed to the point where the major portion of the Ground Support Equipment can be identified. The following items have been selected as essential for the support of Configuration C:

	Recommended Quantity		
	Total for 3 Dets.	FOG	50-50 M&O Total
1. 73-C Power Cart <i>C, A1, A2, B1</i>	3	23	1
2. Specialized Shop Tools			
2.1 Special Wrenches, Cassette	9 sets	6 sets	2 sets
(a) Wrench, Cassette, Adjustment nut (one per set)			
(b) Wrench, Cassette Shaft, retaining (one per set)			
2.2 30" Spirit Level	6	6	4
2.3 Wrench, Configuration A/C Mounting	12	12	8
2.4 Precision Spirit Level (6")	6	6	4
2.5 Machinists Jack, 3"	12	12	8
2.6 Right Angle Extension Flashlight	6	6	4
2.7 Cross Hair Eyepiece	3	3	2
3. Stands and Dollies			
3.1 Spool Storage Stand, 73-C	12	12	8
3.2 Cassette Loading Stand 73-C	3	3	2
3.3 Optical Structure Maintenance Dolly 73-C	3	3	2

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OFFICIAL SURVEYING EQUIPMENT PROJECT PLAN

		Recommended Quantity			
		Total for 3 Dets.	FOG	M & O	Total
3.4	Collimating Stand	3	3 2	1	6
3.5	Preflight Test Stand 73-C	3	3 2	1	6
4.	Electronic Test Equipment (Standard)				
4.1	Tektronix Type 531 Oscilloscope with preamp.	3	3 2	1	6
4.2	Two-channel Sanborn Recorder	3	3 2	1	6
	Electronic Test Equipment (Specialized)				
4.3	Printed Circuit Board Test Set 73-C	3	3 2	1	6
4.4	Phase Sequence Indicator 73-C	3	3 2	1	6
4.5	Special Test Cables, 73-C	3 sets	3 2 sets	1 sets	6 sets
4.6	IMC & Stabilization Test Set 73-C	3	3 2	1	6
4.7	Programmer 73-C Test Set 73-C	3	3 2	1	6
5.	Optical Focus Fixture 73-C	3	3 2	1	6
6.	Shutter Test Adapter and Stand, 73-C	3	3 2	1	6
7.	Film Splicing Fixture 73-C	3	3 2	1	6
8.	Spools, 6-3/4" x 200' (CFE) <i>used by Recce Tech</i>	30	30 20	60	110
9.	Boresighting Mirror (CFE)	3	3 2	1	6
10.	Three-axis Stabilizer Test Stand, 73-C			1	1

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AERIAL SURVEYING EQUIPMENT PROJECT PLAN

Introduction (continued)

A description of the above items is given in next section.

The equipment assigned to the Detachments and Maintenance and Overhaul will be used whenever it is available to support the Test Site operations.

Configuration C

Ground Support Equipment

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Part II Technical Description

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AERIAL SURVEYING EQUIPMENT PROJECT PLAN

1. 73-C Power Cart

Requirement

Configuration C uses three-phase, 400 cycle, power as well as 28V D.C. A special power source which will supply the above power is needed. The power source will be cart mounted for use in the shop and in the hangar for preflight checkout. It can also be used at an advanced staging base if necessary. The three-phase Power Cart will provide the power and vacuum necessary for ground test of Configuration C.

Description

The cart contains a converter to generate three-phase, 400 cycle power, a rectifier unit for 27 Volt D.C. and a vacuum pump.

Input Power: 220 V, 60 cycle, single phase from
base supply or MA2 truck.

Output Power: 1. 110V, 400 cycle, 3 phase 750 VA
2. 28V D.C., 75 amps.
3. Vacuum, Hi Flow, Low Head

The cart will be provided with suitable meters, switches, circuit breakers and cable connectors. It will provide fittings for mounting the existing Electrical Test Set. Cabling will be provided to permit plugging the cart into the aircraft power system to test the Configuration in the aircraft. The cart will be air transportable without additional packaging.

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AERIAL SURVEYING EQUIPMENT PROJECT PLAN

2. Specialized Shop Tools

Requirement

A number of specialized shop tools are needed for preflight and postflight testing of Configuration C, and also for alignment of the optics and bore-sighting to the Drift Sight.

Description

Special wrenches are supplied which include:

- a. Two (2) types of cassette wrenches for loading film spools in the cassettes.
- b. A configuration wrench for mounting the configuration in the aircraft trunions.

To boresight the configuration optics with the Drift Sight the following equipment is supplied:

- a. A 30" level used during the leveling of the aircraft to obtain a suitable reference.
- b. A boresighting mirror which is located on the ground during the boresighting procedure. The Drift Sight axis is adjusted perpendicular to the mirror by auto-collimation.
- c. 3" machinists jacks are supplied to level the boresighting mirror.
- d. Precision spirit levels are used to accurately level the boresighting mirror.
- e. A right angle extension flashlight is supplied to auto-collimate the Drift Sight with the boresighting mirror.

A Cross Hair Eyepiece is supplied for general use in focusing and alignment checks.

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AERIAL SURVEYING EQUIPMENT PROJECT PLAN

3. Stands and Dollies

Requirement

A number of stands and dollies are needed to facilitate testing and handling of Configuration C.

Description

3.1 Spool Storage Stand 73-C

The spool stand will consist of a plywood base, two plywood sides and aluminum angle bracing. At the top-center of each side, a radius will be cut to support a loaded cassette Model 73-C equipped with a cassette shaft or a loaded spool mounted on a cassette shaft.

3.2 Cassette Loading Stand 73-C

The Cassette Loading Stand will consist of a welded tubular steel frame, which mounts a solid steel cantilever shaft for support of cassette and shaft during loading and unloading of Film Spools Model 73-C.

3.3 Optical Structure Maintenance Dolly 73-C

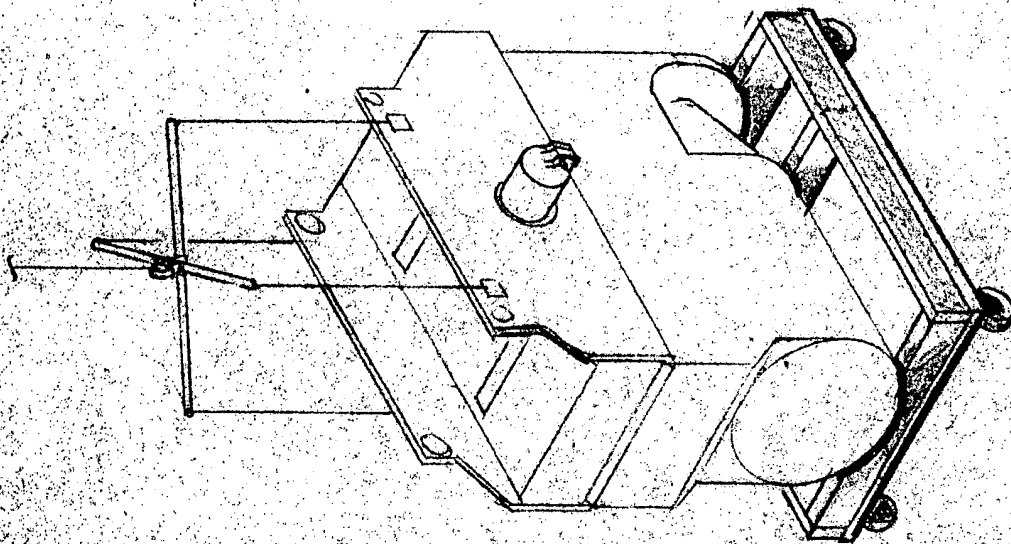
The Optical Structure Maintenance Dolly will consist of a low bed frame mounted on four (4) swivel casters and equipped with three (3) contoured, padded cross members to support the optical structure on the main castings when the superstructure is removed for maintenance.

3.4 Collimating Stand

A stand is needed to support Configurations B and C during collimating. The stand will be of a wooden construction and will consist of four (4) posts with diagonal bracing at each base between posts. Diagonal bracing will be incorporated on three (3) sides only, with the open side for collimating equipment. The configuration carriage lower tubular frame will rest upon each of the four (4) posts during collimation.

Specifications.

1. Sufficient in height to allow collimator free movement under carriage.
2. Sufficient in strength to support the weight of camera and carriage without loss of rigidity.
3. Must be compact as possible.
4. Must be readily disassembled for shipping and storage.



3.3 Optical Structure Maintenance Dolly, 73-C

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AERIAL SURVEYING EQUIPMENT PROJECT PLAN

3. Stands and Dollies (continued)

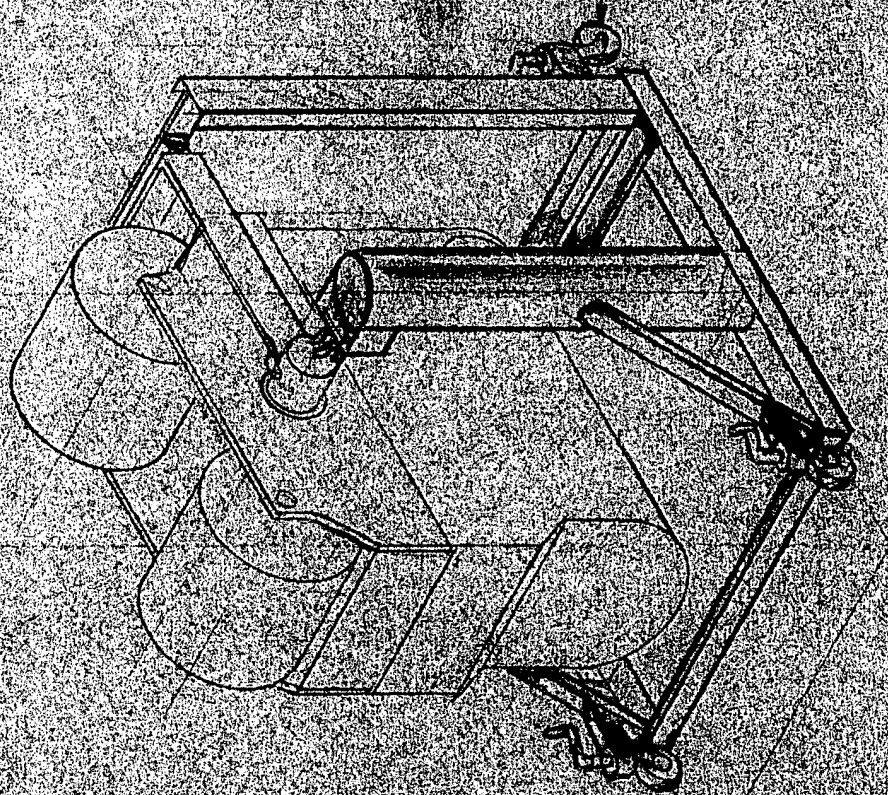
3.5 Preflight Test Stand 73-C

Requirement. A rigid stand for support of Configurations B and C during preflight testing.

Description.

1. Steel weldment capable of accepting a complete Configuration B or C.
2. Height to be approximately same as shipping carriage (3" or 4" floor clearance) with leveling screws.
3. No vibration during camera operations.
4. Retractable casters for maneuverability.

Design Approach. To be a rigid steel weldment with fittings similar to fittings in aircraft. Two (2) primary posts with auxiliary posts and braces for attaching captivator structure. Frame to have leveling screws for leveling complete unit with configuration before tests. Casters will be of such a design they can be raised to let frame rest on floor during tests.



RETRACTABLE CASTERS

3.5 Preflight Test Stand, 73-C

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AERIAL SURVEYING EQUIPMENT PROJECT PLAN

4. Electronic Test Equipment

Requirement

The circuitry of Configuration C is of such complexity that a number of items of electronic test equipment is required. In some cases, standard commercial products can be used. In other cases, specially designed components are required.

Description

The standard electronic equipment required is:

4.1 Tektronix Oscilloscope Type 531

The Tektronix Oscilloscope Type 531 is required in trouble-shooting of the stabilizer circuits and checking wave forms and error signals in the servo packages. The high accuracy of calibration and the high sensitivity of this particular scope are essential to the above work. The Tektronix Oscilloscope Type 531 will be mounted on a roll-away cart. The DuMont scope furnished with the Shutter Test Set, while satisfactory for that application, cannot perform functions necessary in this instance.

4.2 Sanborn Recorder (Two Channels)

The Sanborn Recorder is needed to record the low frequency signals in the servo circuits, the outputs of the IMC and the stabilizer rates. The high accuracy of the Sanborn Recorder is essential because the IMC rate must be read to 1%.

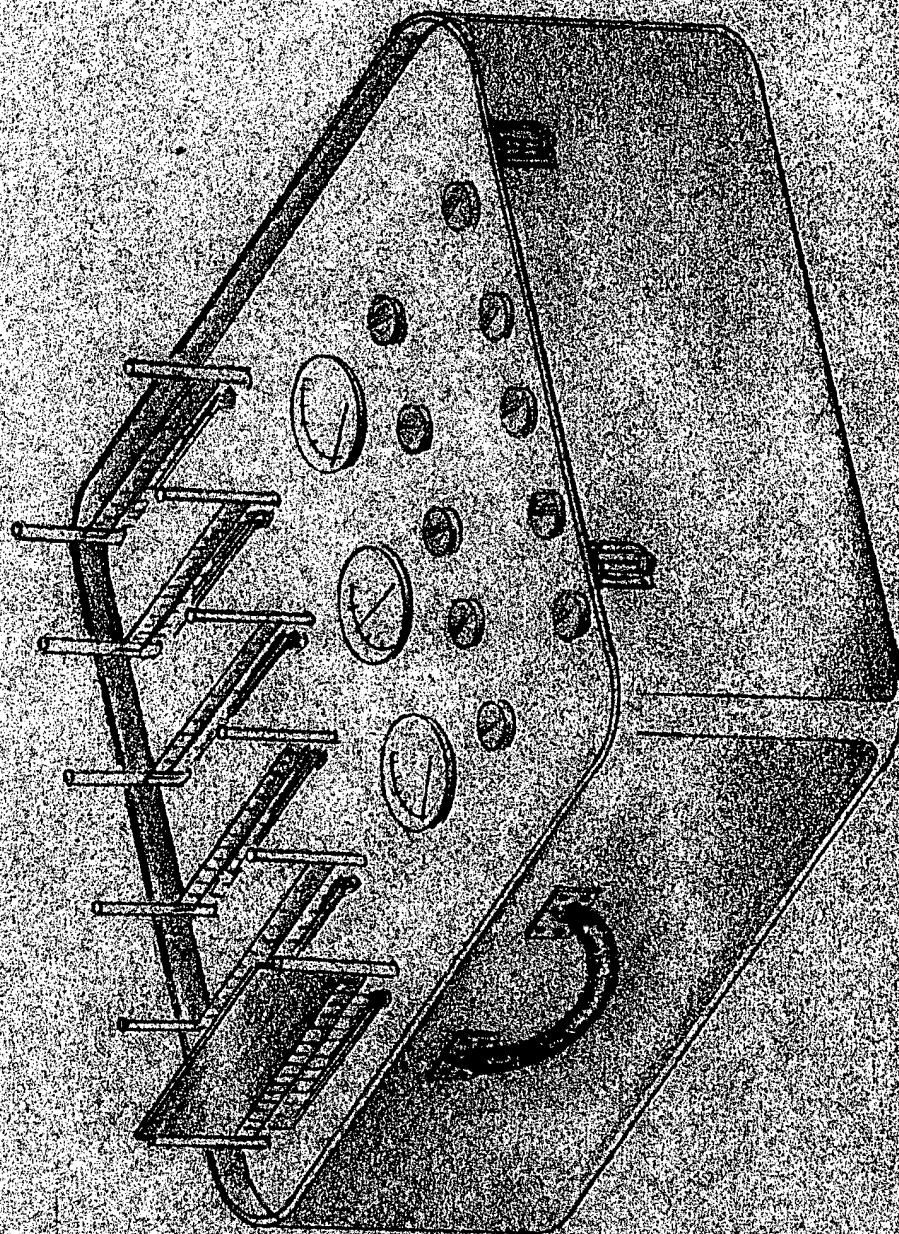
The specialized electronic equipment required is:

4.3 Printed Circuit Board Test Set 73-C

To determine whether a particular circuit board is operating satisfactorily, it is necessary to provide simulated inputs and monitor the outputs. The Circuit Board Test Set 73-C will be packaged in a convenient carrying case, will permit insertion of circuit boards, will have the circuitry to provide simulated input signals to each board and will have panel meters to indicate the operating characteristics. It will also have its own power supply.

4.4 Phase Sequence Indicator 73-C

A Phase Sequence Indicator is required to insure proper connection of the electrical power to the external power supply. Proper phase sequence is necessary to insure that the various motors and gyroscopes rotate in the correct direction.



4.3 Printed Circuit Board Test Set, 73-C

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AERIAL SURVEYING EQUIPMENT PROJECT PLAN

4. Electronic Test Equipment (continued)

4.5 Special Test Cables 73-C

In order to permit access to circuits while units are installed on the configuration and operating, a number of special jumper cables are required which provide test points conveniently accessible. It is expected that a jumper cable will be required for the Programmer, Stabilizer, Film Drive Servo, Oblique Drive Servo, gyro block, and the main configuration test cable.

4.6 IMC and Stabilization Test Set

This test set consists of an audio oscillator, linear amplifier, phase detector, and suitable packaging. Differential transformers are required to monitor the stabilization and IMC rates. The differential transformers are attached to the Stabilizer Mount across the gimbals. The audio oscillator generates a 3 KC signal to the differential transformers. The signal is detected by the phase detector, amplified by the linear amplifier, and then displayed on the Tektronix Scope or recorded on the Sanborn Recorder.

4.7 Programmer 73-C Test Set

This unit tests all functions of Programmer 73-C and displays all circuits tested on panel lights.

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5. Optical Focus Fixture 73-C

Requirement

A special fixture is required for focusing and to align the image to the platen.

Description

A dummy platen with five (5) removable plugs is used in place of the platen during alignment and focusing. Three types of inserts can be placed in the plug holes. These consist of cross hair tubes, ground glass tubes, and polished flat plugs. These are accurately referenced to the theoretical film plane to permit focusing through the dummy platen and for auto-collimation.

AERIAL SURVEYING EQUIPMENT PROJECT PLAN

6. Shutter Test Set Adapter, 73-C

Requirement

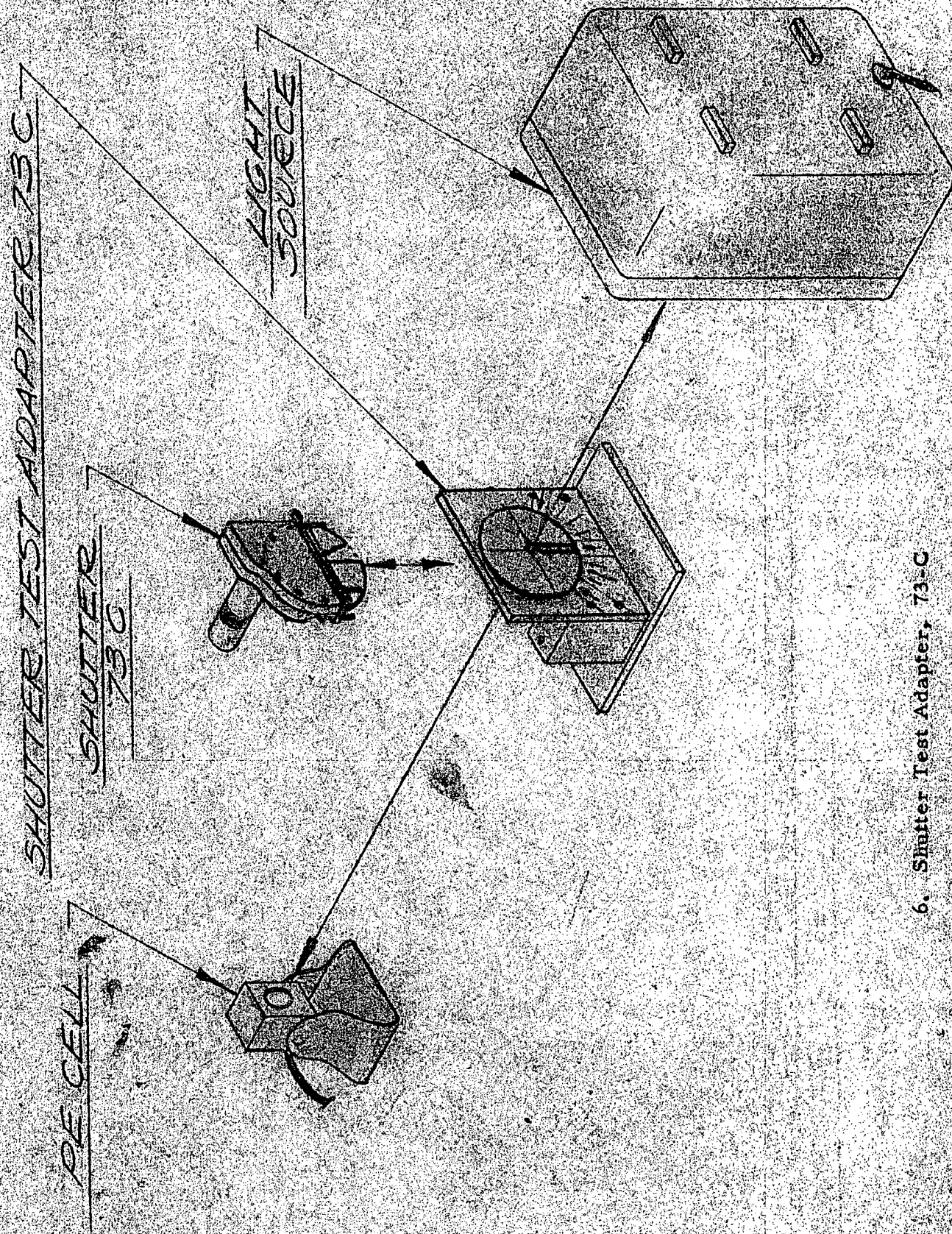
An adapter for testing the operation of the Shutter Model 73-C and to measure total time open.

Description

1. 110 Volt, 400 cycle/sec., 1 phase power cable to operate shutter drive motor.
2. 28 Volt D. C. power cable to operate tripping circuit.
3. An adjustable slot that can be indexed to check the exposure in different sections of the format.

Design Approach

The adapter will be used in combination with the existing Shutter Test Set utilizing the light Source, Photocell, DuMont Scope, and Polaroid Camera attachment. A narrow slot, coincident with the shutter center line will be placed adjacent to the shutter disc to mask out the format except for the slot. The light source will be imaged on the photocell through this slot. The resultant trace on the scope will be photographed using the Polaroid camera. The length of the pulse is the shutter Total Open Time. Indexing the slot in different positions relative to the format and measuring Total Open Time indicates irregularity of shutter operation.



6. Shutter Test Adapter, 73-C

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AERIAL SURVEYING EQUIPMENT PROJECT PLAN

7. Film Splicing Fixture 73-C

Requirement

A splicing fixture is needed for cutting and splicing film on the configuration. It will be mounted on the configuration between the Film Drive and Cassette during use.

Description

The Film Splicing Fixture 73-C is to be light in weight, suitable for mounting on the camera between the Film Drive and the Cassette. The fixture will have film holding clamps, and a sliding film cutting blade with retainer.

Design Approach

The splicing fixture will have a wooden base, phenolic top, hinged metal film clamps with neoprene facing for retaining film, and a metal guide which will retain and guide the cutting blade.

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8. Spools

6-3/4" x 200' spools are required for evaluation and storage of test strips.

9. Boresighting Mirror

A 13" diameter front surface aluminized mirror is used in boresighting the drift sight in respect to the optical axis of Configuration C. A storage case is supplied. This unit will be a model made by Perkin-Elmer Corp. and furnished by the Customer.

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10. Three-Axis Stabilizer Test Stand, 73-C

Requirement

In order to achieve a complete systems test it is necessary to simulate aircraft oscillation. It is also desirable to vary the frequency and amplitude of oscillation about three axes.

Description

The rocking stand consists of a base which holds the complete configuration as mounted on the ground handling carriage. This base is supported on a frame which has three variable speed motors, each driving this base about orthogonal axes. The amplitude of oscillation is varied by interchanging cams. The frequency is continuously variable by the motor controllers.

Configuration C

Ground Support Equipment

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Part III Contract Exhibit, Proposed

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AERIAL SURVEYING EQUIPMENT
PROJECT PLAN

III. Contract Exhibit, Ground Support Equipment, Configuration C, Proposed

Item No.	Description	Unit Price	Customer A		Customer B		M & O		Total	
			Qty.	Price	Qty.	Price	Qty.	Price	Qty.	Price
1	73-C Power Cart #735420 Delivery: 31 May 1957	8,000.00	3	24,000.00	2	16,000.00	1	8,000.00	6	48,000.00
2	Specialized Shop Tools Delivery: 31 May 1957									
2.1	Special Wrenches, Cassette (a) Wrench, Cassette Adjust- ment Nut(one ea. per set) (b) Wrench, Cassette Shaft Retaining(one ea. per set)	40.00/set	9 sets	360.00	6 sets	240.00	2 sets	80.00	17 sets	680.00
2.2	30" Spirit Level	17.60	6	105.60	4	70.40			10	176.00
2.3	Wrench, Config. A/C Mounting	1.50	12	18.00	8	12.00	2	3.00	22	33.00
2.4	Precision Spirit Level, 6"	35.00	6	210.00	4	140.00			10	350.00
2.5	Machinists Jack, 3"	5.75	12	69.00	8	46.00			20	115.00
2.6	Right Angle Extension Flashlight	16.00	6	96.00	4	64.00			10	160.00
2.7	Cross Hair Eyepiece	35.00	3	105.00	2	70.00			5	175.00
	Stands and Dollies Delivery: 30 June 1957									
3.1	Spool Storage Stand 73-C	48.00	12	576.00	8	384.00	4	192.00	24	1,152.00
3.2	Cassette Loading Stand 73-C	165.00	3	495.00	2	330.00	1	165.00	6	990.00

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III. Contract Exhibit (continued)

Item No.	Description	Unit Price	Customer A		Customer B		M & O		Total	
			Qty.	Price	Qty.	Price	Qty.	Price	Qty.	Price
3.3	Optical Structure Maintenance Dolly 73-C	180.00	3	540.00	2	360.00	1	180.00	6	1,080.00
3.4	Collimating Stand	450.00	3	1,350.00	2	900.00	1	450.00	6	2,700.00
3.5	Configuration Preflight Stand 73-C	1,600.00	3	4,800.00	2	3,200.00	1	1,600.00	6	9,600.00
4	<u>Electronic Test Equipment</u>									
4.1	Tektronix Scope Type 531 Delivery: 31 May 1957	2,013.00	3	6,039.00	2	4,026.00	1	2,013.00	6	12,078.00
4.2	Two-Channel Sanborn Recorder Delivery: 31 May 1957	2,895.00	3	8,685.00	2	5,790.00	1	2,895.00	6	17,370.00
4.3	Printed Circuit Board Test Set 73-C, First Article Delivery: 31 April 1957	2,250.00					1	2,250.00	1	2,250.00
4.3.1	Printed Circuit Board Test Set 73-C, Production Units Delivery: 31 May 1957	1,840.00	3	5,520.00	2	3,680.00			5	9,200.00
4.4	Phase Sequence Indicator 73-C Delivery: 31 May 1957	285.00	3	855.00	2	570.00	1	285.00	6	1,710.00

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II. Contract Exhibit (continued)

Item No.	Description	Unit Price	Customer A		Customer B		M & O		Total	
			Qty.	Price	Qty.	Price	Qty.	Price	Qty.	Price
4.5	Special Test Cable Set 73-C includes: one (1) Programmer Jumper Cable one (1) Stabilizer, Jumper Cable One (1) Film Drive Servo, Jumper Cable one (1) Oblique Drive Servo, Jumper Cable one (1) Gyro Block, Jumper Cable one (1) Config. C Test Cable Delivery: 31 May 1957	300.00	3 sets	900.00	2 sets	600.00	1 set	300.00	6 sets	1,800.00
4.6	IMC & Stabilization Test Set 73-C									
4.6.1	First Article Delivery: 30 June 1957	4,990.00					1	4,990.00	1	4,990.00
4.6.2	Production Units Delivery: 31 July 1957	2,750.00	3	8,250.00	2	5,500.00			5	13,750.00
4.7	Programmer 73-C Test Set Delivery: 30 June 1957	685.00	3	2,055.00	2	1,370.00	1	685.00	6	4,110.00
	Optical Focus Fixture, 73-C First Article Delivery: 31 May 1957	1,675.00					1	1,675.00	1	1,675.00
5.1	Optical Fokus Fixture, 73-C, Production Units Delivery: 30 June 1957	1,457.00	3	4,371.00	2	2,914.00			5	7,285.00

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AERIAL SURVEYING EQUIPMENT
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II. Contract Exhibit (continued)

Item No.	Description	Unit Price	Customer A		Customer B		M & O		Total	
			Qty	Price	Qty	Price	Qty	Price	Qty	Price
	Shutter Test Adapter & Stand 73-C Delivery: 31 May 1957	624.00	3	1,872.00	2	1,248.00	1	624.00	6	3,744.00
	Film Splicing Fixture 73-C, First Article Delivery: 31 May 1957	600.00					1	600.00	1	600.00
7.1	Film Splicing Fixture 73-C, Production Units Delivery: 30 June 1957	410.00	3	1,230.00	2	820.00			5	2,050.00
	Spools 6-3/4" x 200'	CFE	30		20		60		110	CFE
	Boresight Mirror w/case, Perkin-Elmer Type	CFE	3		2		1		6	CFE
0	Three-Axis Stabilizer Test Stand 73-C Delivery: 30 April 1957	10,279.00					1	10,279.00	1	10,279.00
	Sub-Total			72,501.60		48,334.40		37,266.00		
	Allocation of Maintenance and Overhaul Price to Customers A and B, 50-50 basis.			18,633.00		18,633.00				
	TOTAL PRICE			91,134.60		66,967.40				158,102.00